FIG.1

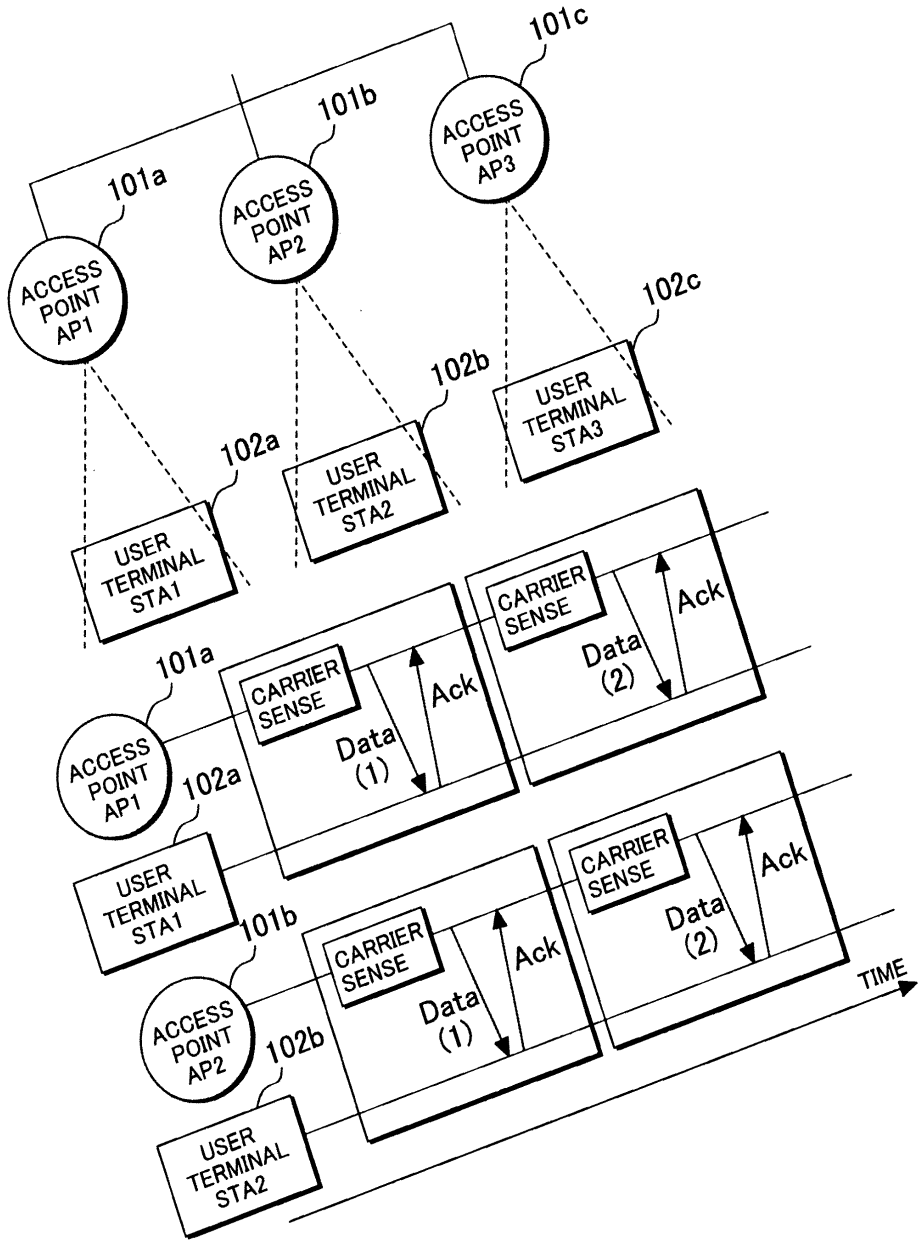

101c
101b
101a
ACCESS POINT AP3
ACCESS POINT AP2
ACCESS POINT AP1
102c
102b
102a
USER TERMINAL STA3
USER TERMINAL STA2
USER TERMINAL STA1
CARRIER SENSE
Data (1)
Ack
Data (2)
TIME

FIG.2

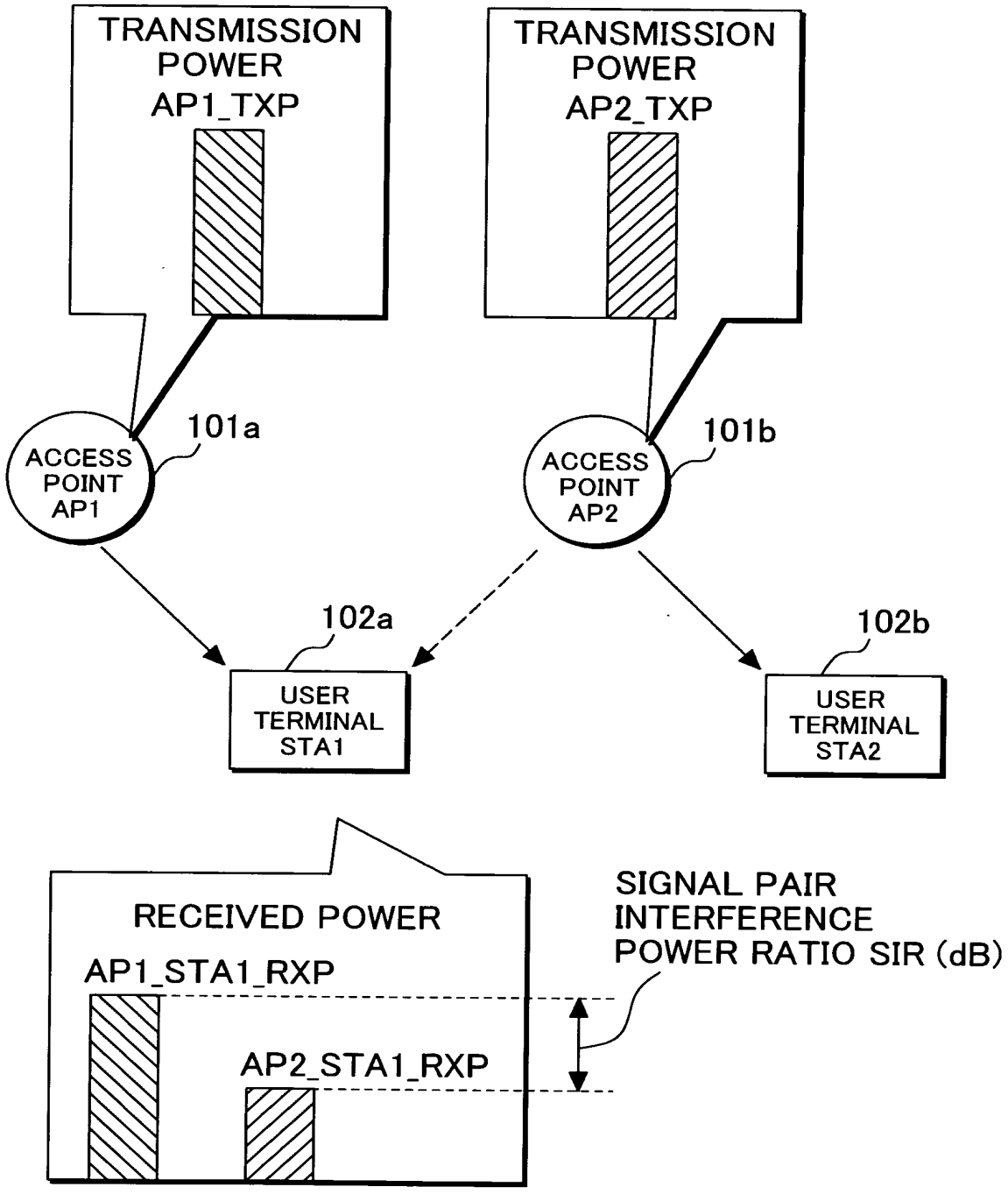

TRANSMISSION POWER AP1_TXP
TRANSMISSION POWER AP2_TXP
ACCESS POINT AP1
101a
ACCESS POINT AP2
101b
102a
USER TERMINAL STA1
102b
USER TERMINAL STA2
RECEIVED POWER
AP1_STA1_RXP
AP2_STA1_RXP
SIGNAL PAIR INTERFERENCE POWER RATIO SIR (dB)

FIG.3

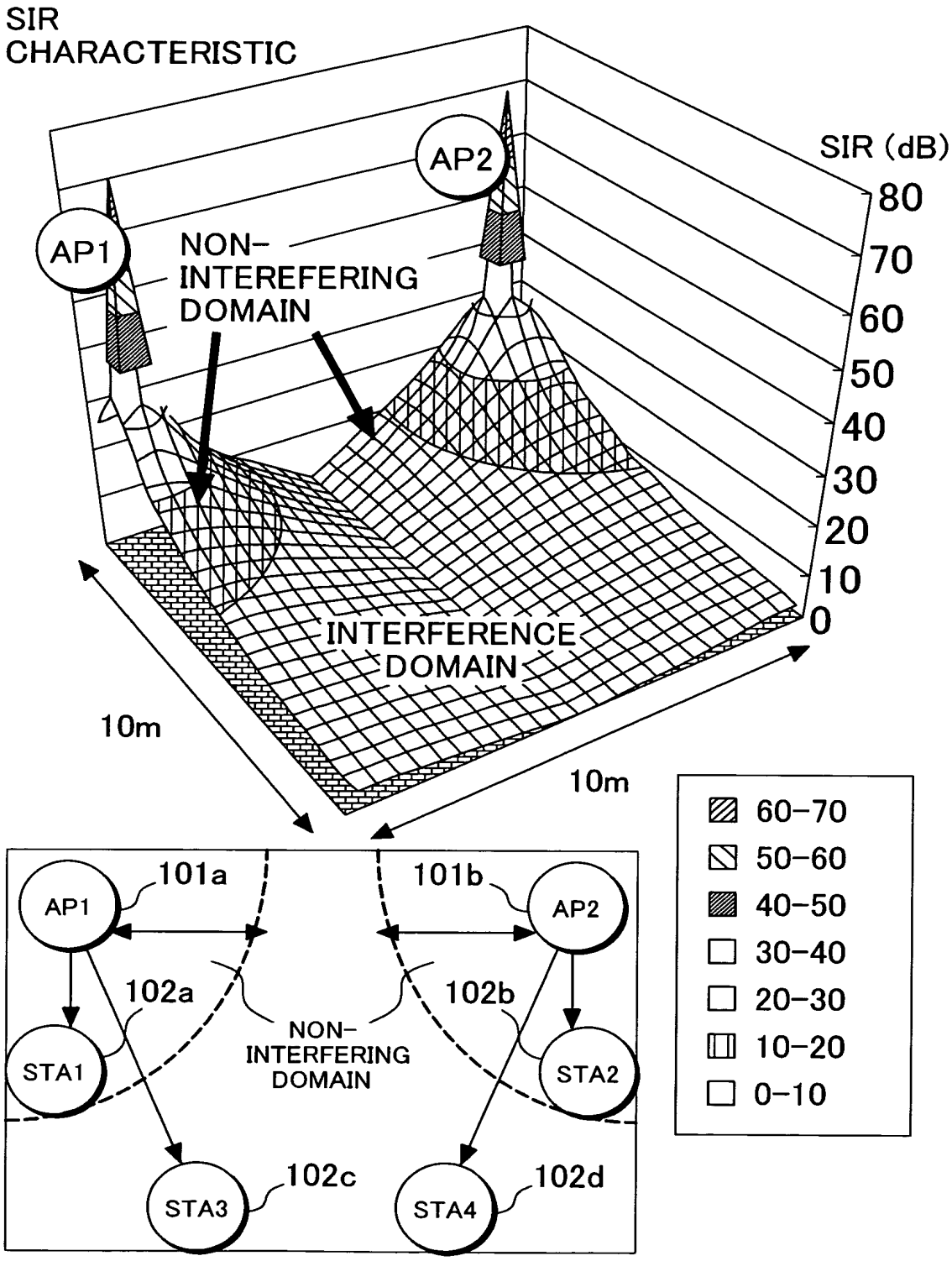

SIR
CHARACTERISTIC
SIR (dB)
80
70
60
50
40
30
20
10
0
AP1
AP2
NON-
INTEREFERING
DOMAIN
INTERFERENCE
DOMAIN
10m
10m
60-70
50-60
40-50
30-40
20-30
10-20
0-10
AP1
101a
101b
AP2
102a
102b
NON-
INTERFERING
DOMAIN
STA1
STA2
STA3
102c
STA4
102d

FIG.4

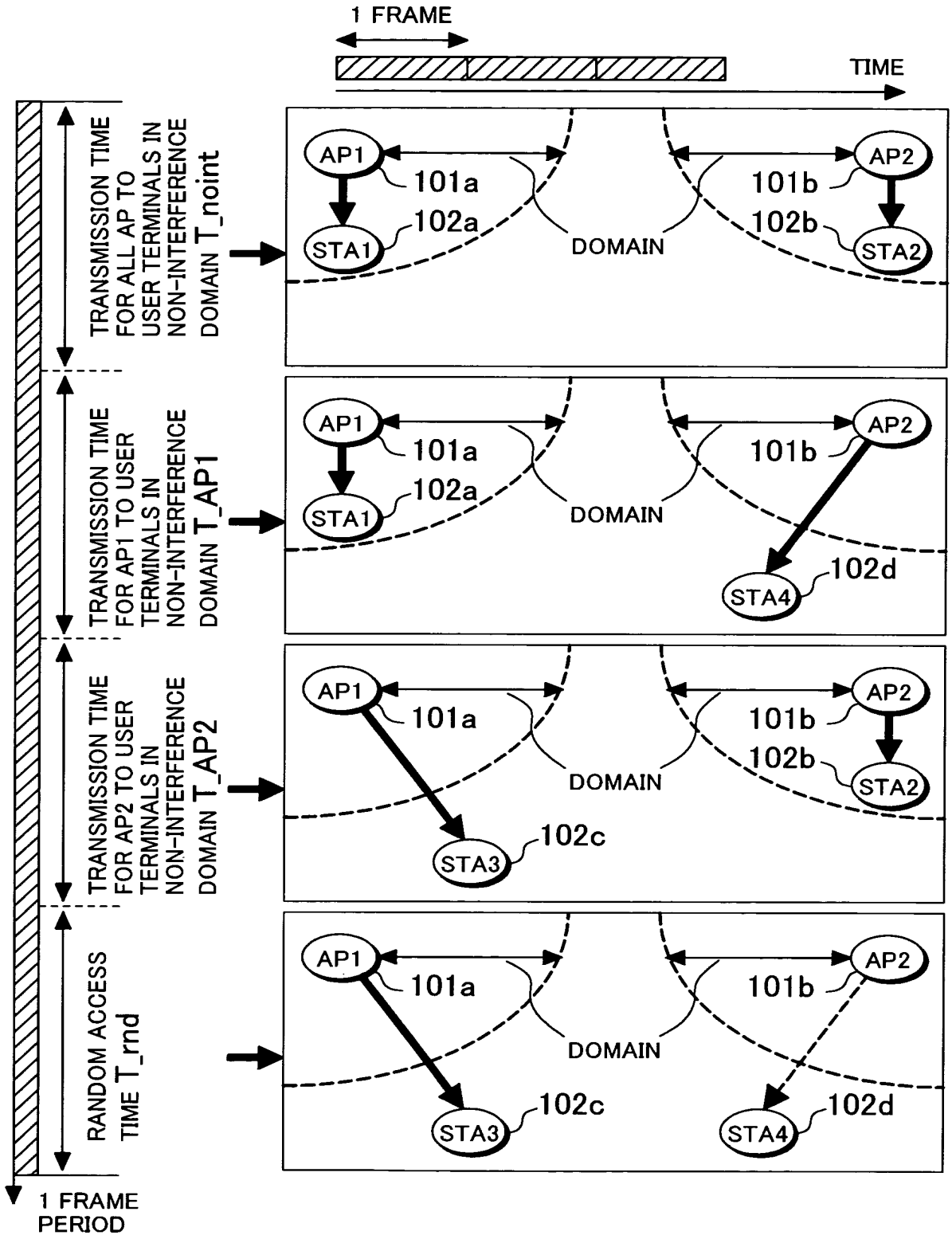

1 FRAME
TIME
TRANSMISSION TIME FOR ALL AP TO USER TERMINALS IN NON-INTERFERENCE DOMAIN T_noint
TRANSMISSION TIME FOR AP1 TO USER TERMINALS IN NON-INTERFERENCE DOMAIN T_AP1
TRANSMISSION TIME FOR AP2 TO USER TERMINALS IN NON-INTERFERENCE DOMAIN T_AP2
RANDOM ACCESS TIME T_rnd
1 FRAME PERIOD
AP1
AP2
STA1
STA2
STA3
STA4
101a
101b
102a
102b
102c
102d
DOMAIN

FIG.5

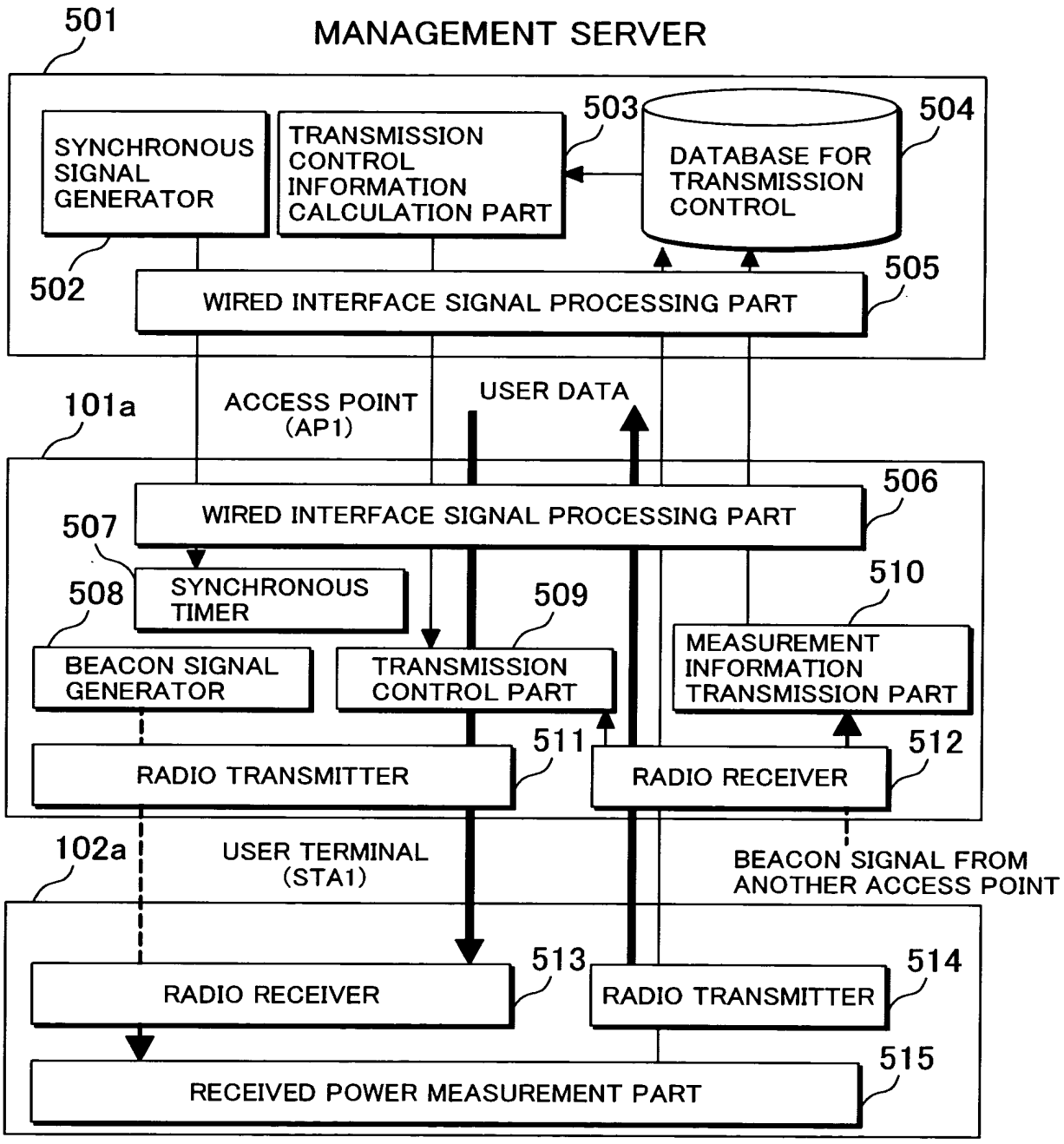

501
MANAGEMENT SERVER
SYNCHRONOUS SIGNAL GENERATOR
TRANSMISSION CONTROL INFORMATION CALCULATION PART
503
DATABASE FOR TRANSMISSION CONTROL
504
502
WIRED INTERFACE SIGNAL PROCESSING PART
505
101a
ACCESS POINT (AP1)
USER DATA
WIRED INTERFACE SIGNAL PROCESSING PART
506
507
SYNCHRONOUS TIMER
508
509
510
BEACON SIGNAL GENERATOR
TRANSMISSION CONTROL PART
MEASUREMENT INFORMATION TRANSMISSION PART
511
512
RADIO TRANSMITTER
RADIO RECEIVER
102a
USER TERMINAL (STA1)
BEACON SIGNAL FROM ANOTHER ACCESS POINT
513
514
RADIO RECEIVER
RADIO TRANSMITTER
515
RECEIVED POWER MEASUREMENT PART

FIG.6

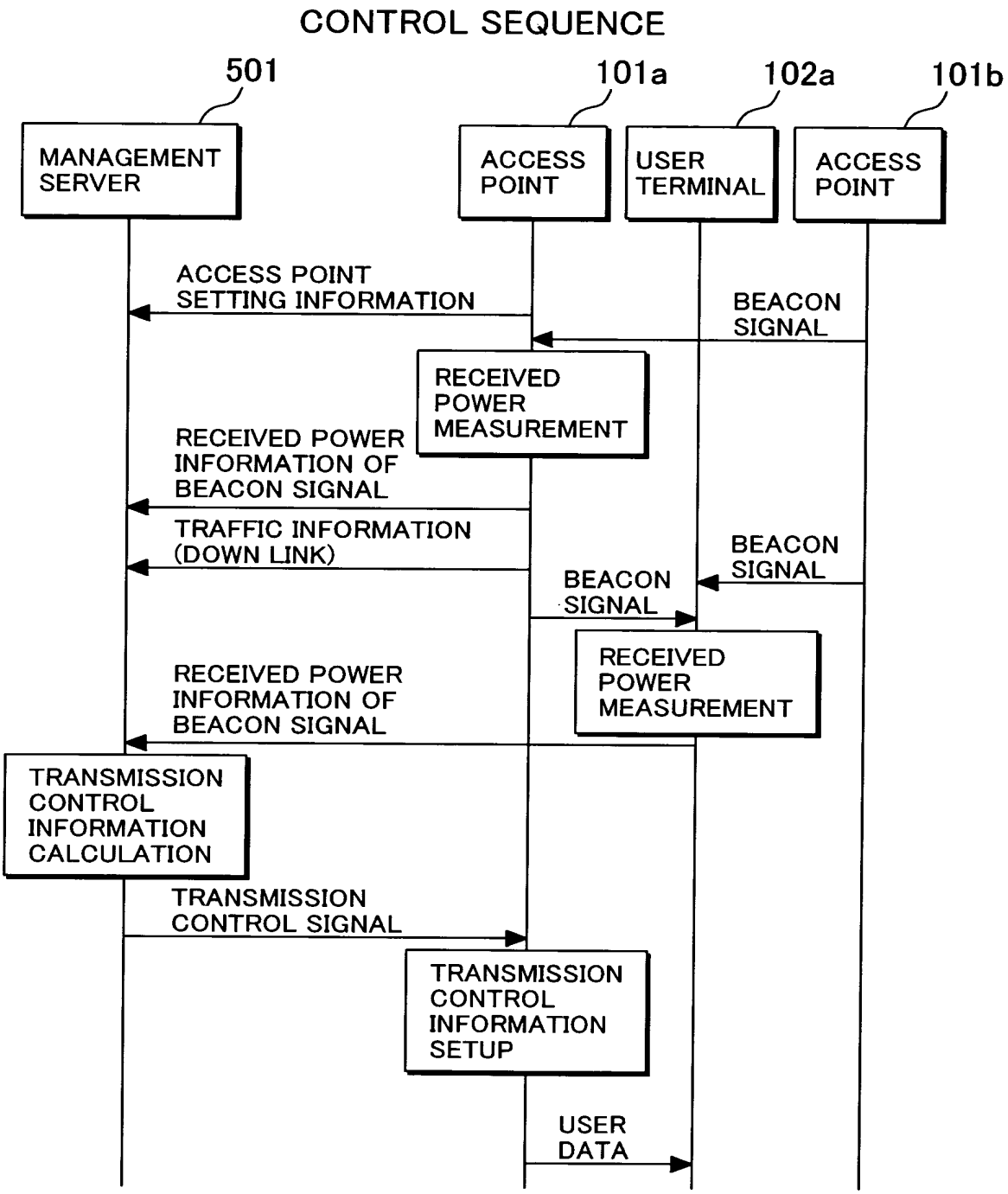

CONTROL SEQUENCE
501
101a
102a
101b
MANAGEMENT SERVER
ACCESS POINT
USER TERMINAL
ACCESS POINT
ACCESS POINT SETTING INFORMATION
BEACON SIGNAL
RECEIVED POWER MEASUREMENT
RECEIVED POWER INFORMATION OF BEACON SIGNAL
TRAFFIC INFORMATION (DOWN LINK)
BEACON SIGNAL
BEACON SIGNAL
RECEIVED POWER MEASUREMENT
RECEIVED POWER INFORMATION OF BEACON SIGNAL
TRANSMISSION CONTROL INFORMATION CALCULATION
TRANSMISSION CONTROL SIGNAL
TRANSMISSION CONTROL INFORMATION SETUP
USER DATA

FIG.7

DATABASE INFORMATION FOR TRANSMISSION CONTROL

(1) ACCESS POINT SETTING INFORMATION

	TRANSMISSION POWER OF BEACON SIGNAL	CARRIER SENSE THRESHOLD
AP 1	15 dBm	−94 dBm
AP i	AP i_Btxp	AP i_CSthr
AP X	15 dBm	−90 dBm

(2) RECEIVED POWER INFORMATION OF BEACON SIGNAL OF ACCESS POINTS

	AP 1	・・	AP i	AP X
AP 1	−			−94 dBm
AP j			AP i_AP j_Brxp	
AP X	−94 dBm			−

(3) RECEIVED POWER INFORMATION OF BEACON SIGNAL OF USER TERMINALS

	AP 1	・・	AP i	AP X
STA 1	−65 dBm			−94 dBm
STA j			AP i_STA j_Brxp	
STA X	−94 dBm			−62 dBm

(4) TRAFFIC INFORMATION OF ACCESS POINTS (DOWNLINK)

	STA 1	・・	STA j	STA X
AP 1	8 kbit/s			250 kbit/s
AP i			AP i_STA j_TRA	
AP X	100 kbit/s			100 kbit/s

FIG.8

ALGORITHM OF TRANSMISSION CONTROL INFORMATION CALCULATION PART OF A MANAGEMENT SERVER (STEP1: TRANSMISSION POWER CALCULATION)

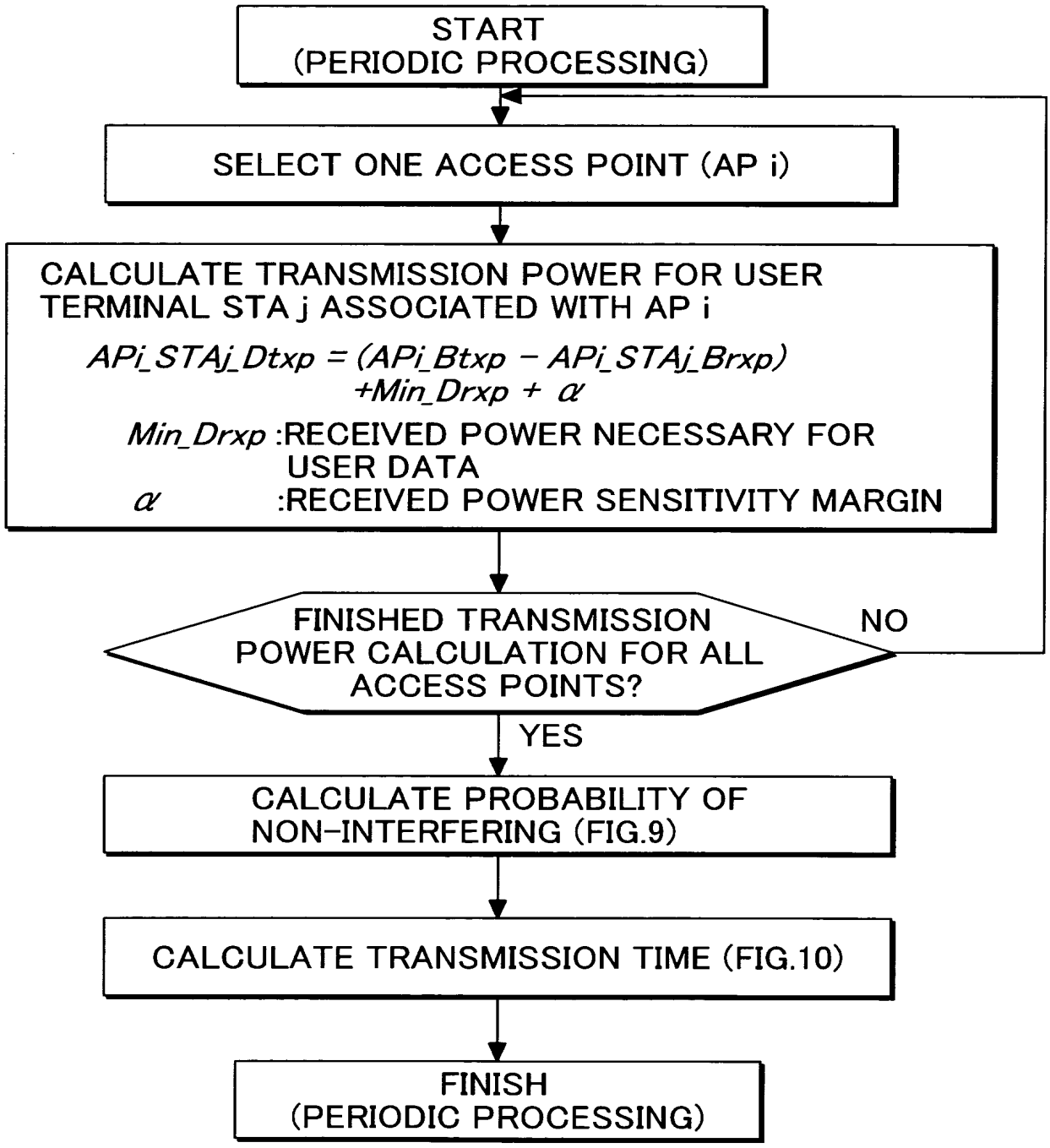


FIG.9

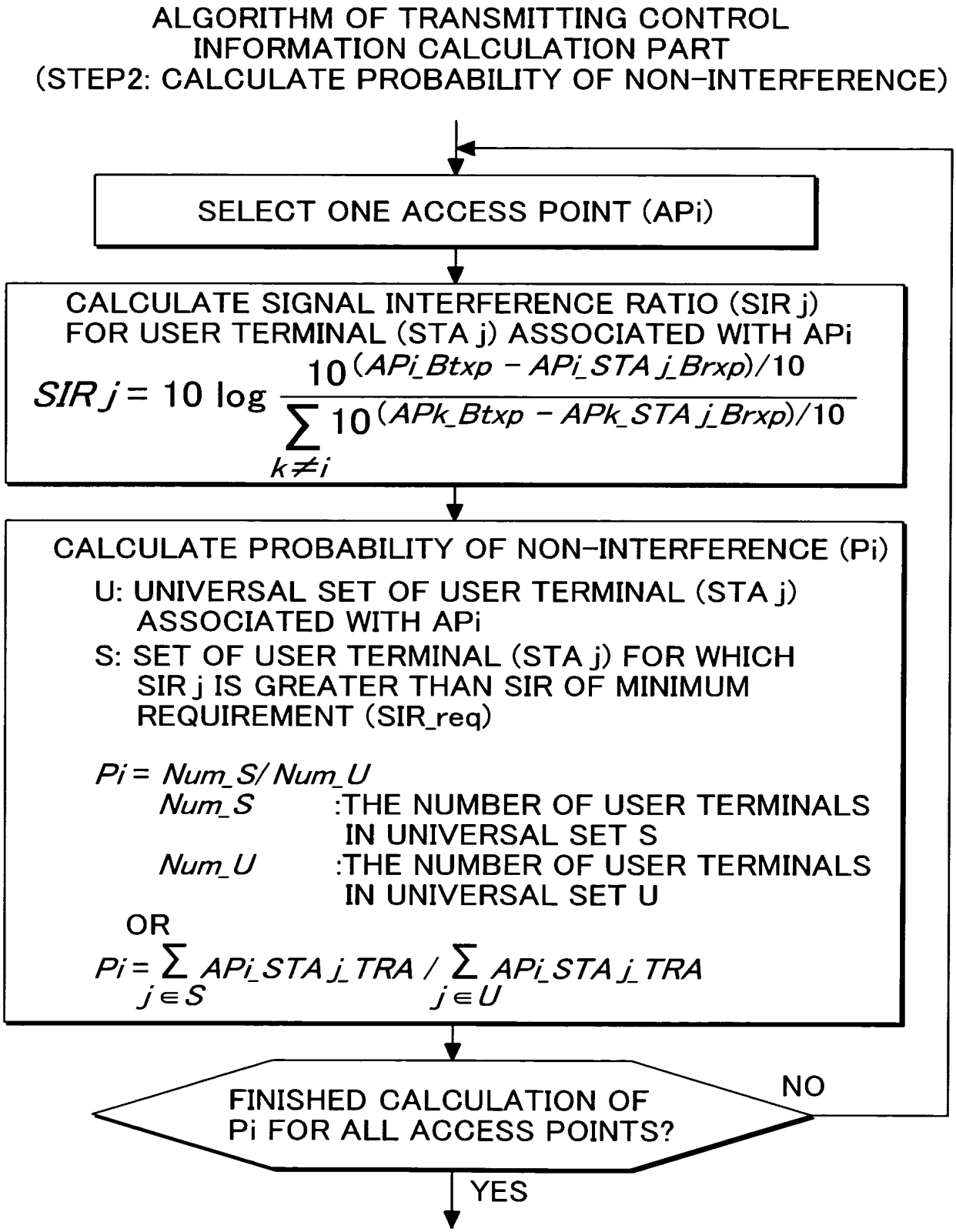

ALGORITHM OF TRANSMITTING CONTROL INFORMATION CALCULATION PART (STEP2: CALCULATE PROBABILITY OF NON-INTERFERENCE)
SELECT ONE ACCESS POINT (APi)
CALCULATE SIGNAL INTERFERENCE RATIO (SIR j) FOR USER TERMINAL (STA j) ASSOCIATED WITH APi
$SIR\,j = 10 \log \frac{10^{(APi_Btxp - APi_STA\,j_Brxp)/10}}{\sum_{k \neq i} 10^{(APk_Btxp - APk_STA\,j_Brxp)/10}}$
CALCULATE PROBABILITY OF NON-INTERFERENCE (Pi)
U: UNIVERSAL SET OF USER TERMINAL (STA j) ASSOCIATED WITH APi
S: SET OF USER TERMINAL (STA j) FOR WHICH SIR j IS GREATER THAN SIR OF MINIMUM REQUIREMENT (SIR_req)
$Pi = Num_S / Num_U$
Num_S :THE NUMBER OF USER TERMINALS IN UNIVERSAL SET S
Num_U :THE NUMBER OF USER TERMINALS IN UNIVERSAL SET U
OR
$Pi = \sum_{j \in S} APi_STA\,j_TRA \,/\, \sum_{j \in U} APi_STA\,j_TRA$
FINISHED CALCULATION OF Pi FOR ALL ACCESS POINTS?
NO
YES

FIG.10

ALGORITHM OF TRANSMITTING CONTROL INFORMATION CALCULATION PART
(STEP3: CALCULATE TRANSMISSION TIME)

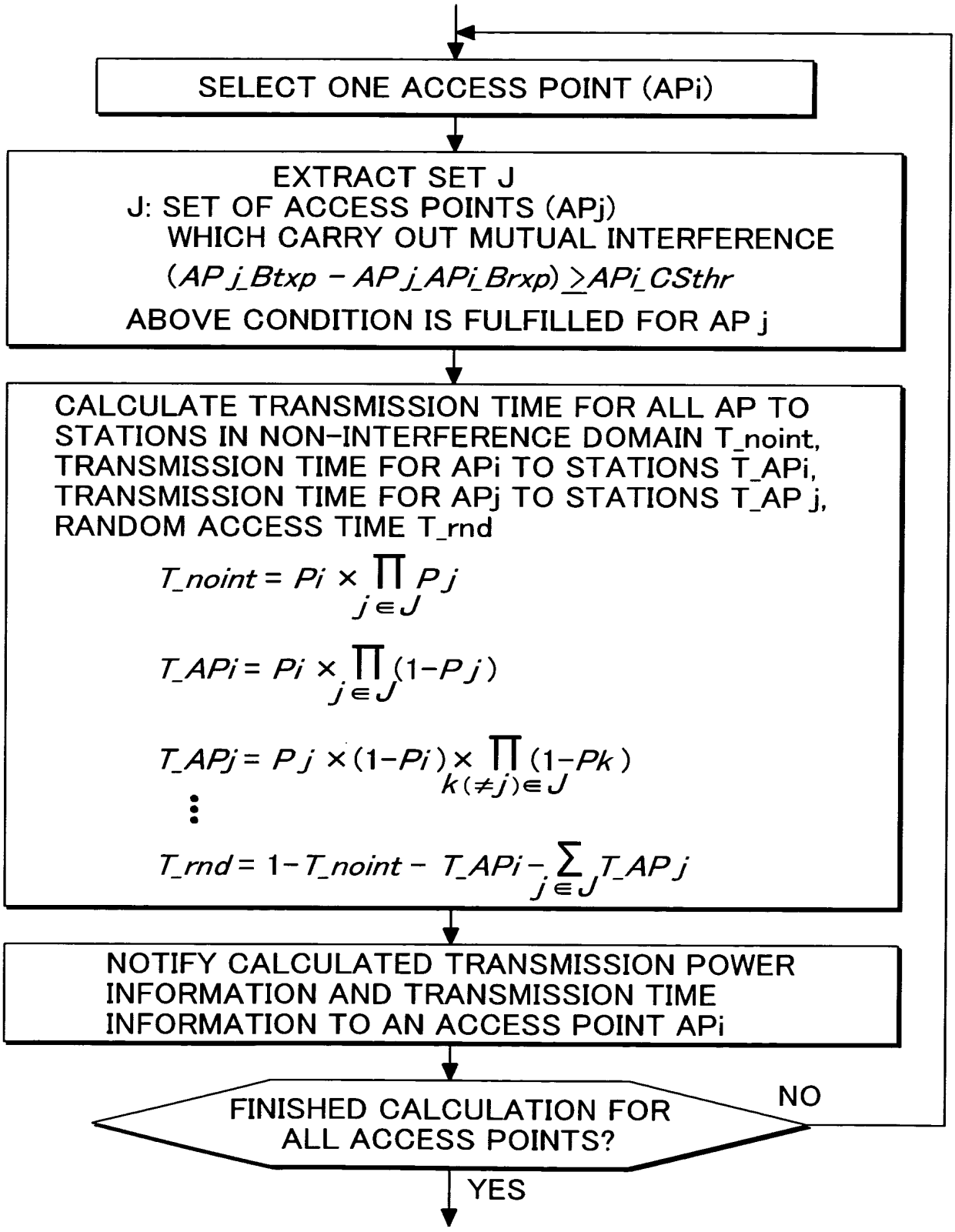


FIG.11

TRANSMITTING CONTROL SIGNAL INFORMATION FROM A MANAGEMENT SERVER TO AN ACCESS POINT

1 CONTROL FRAME PERIOD (T_frame)		
TRANSMISSION TIME FOR ALL AP TO STATIONS IN NON-INTERFERENCE DOMAIN (T_noint)		
THE NUMBER OF ACCESS POINTS WHICH CARRY OUT MUTUAL INTERFERENCE		
AP1 ID	TRANSMISSION TIME FOR AP1 T_AP1	
AP2 ID	TRANSMISSION TIME FOR AP2 T_AP2	
RANDOM ACCESS TIME (T_rnd)		
THE NUMBER OF USER TERMINALS (STA_Num)		
SIR OF MINIMUM REQUIREMENT (SIR_req)		
STA1 ID	SIR 1	TRANSMISSION POWER AP1_STA1_Dtxp
STA3 ID	SIR 3	TRANSMISSION POWER AP1_STA3_Dtxp

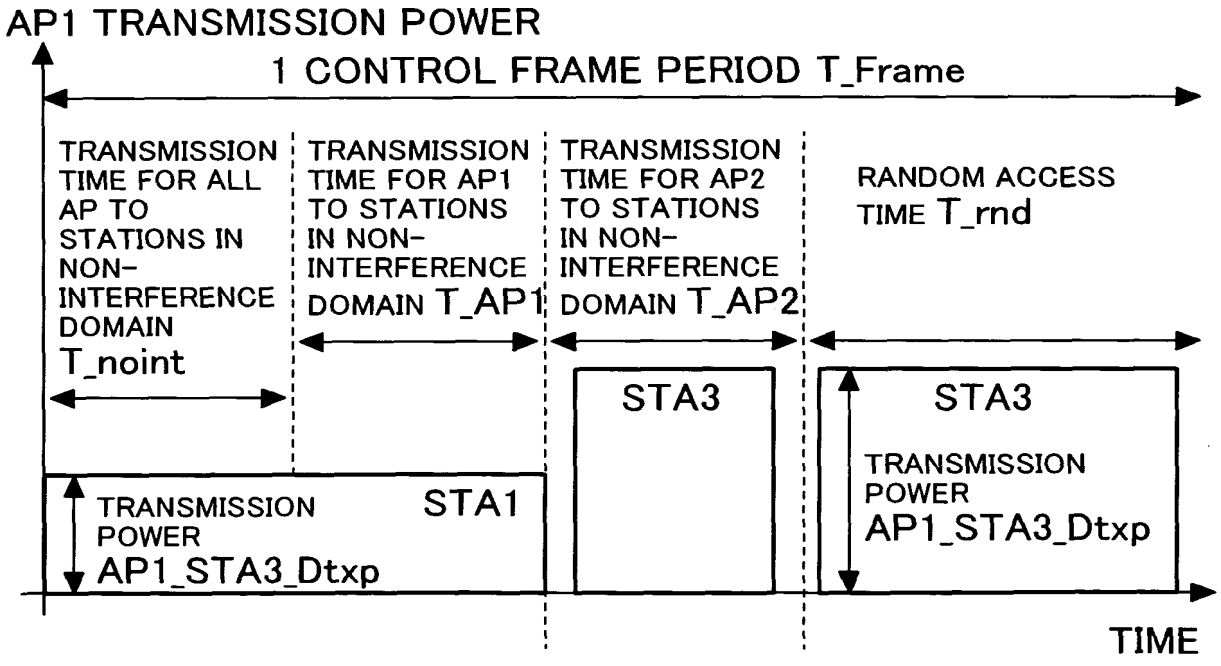


FIG.12

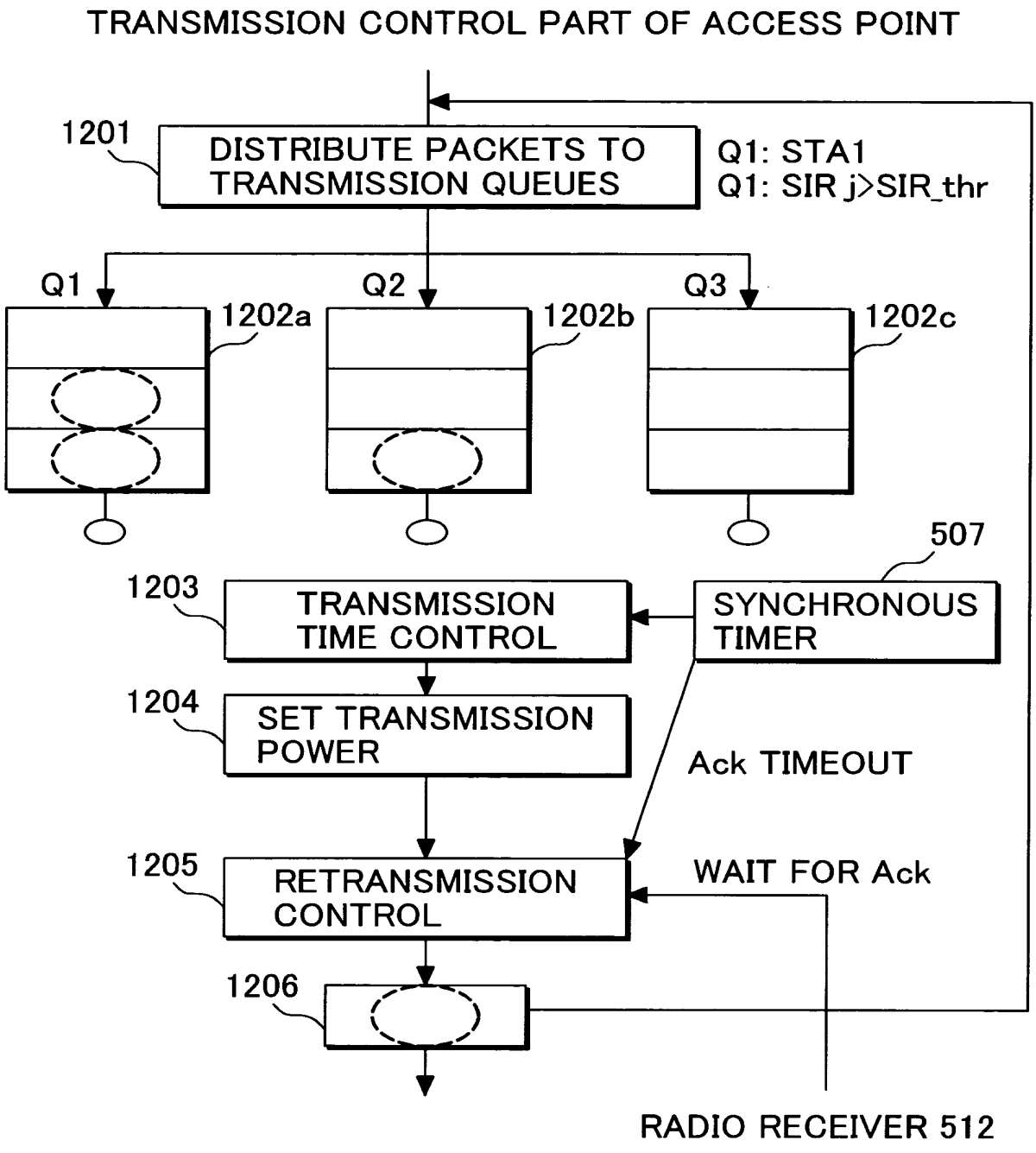
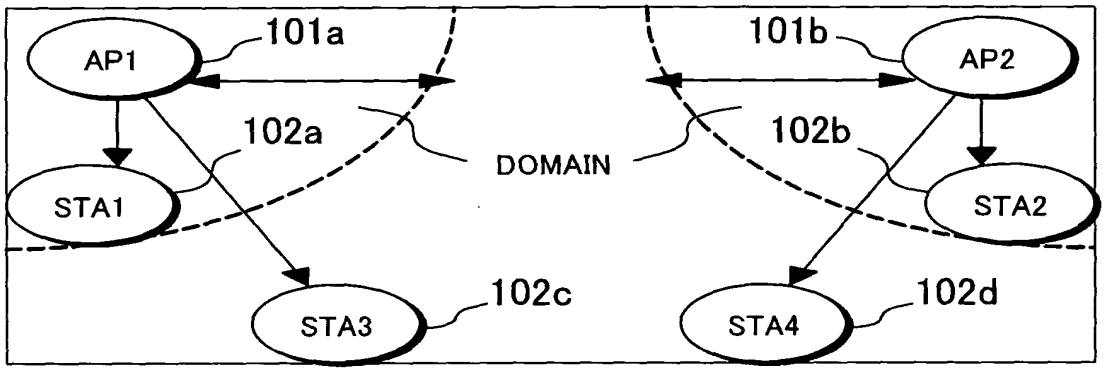

TRANSMISSION CONTROL PART OF ACCESS POINT
1201
DISTRIBUTE PACKETS TO TRANSMISSION QUEUES
Q1: STA1
Q1: SIR j>SIR_thr
Q1
Q2
Q3
1202a
1202b
1202c
507
1203
TRANSMISSION TIME CONTROL
SYNCHRONOUS TIMER
1204
SET TRANSMISSION POWER
Ack TIMEOUT
1205
RETRANSMISSION CONTROL
WAIT FOR Ack
1206
RADIO RECEIVER 512

FIG.13


AP1
101a
101b
AP2
102a
DOMAIN
102b
STA1
STA2
STA3
102c
STA4
102d

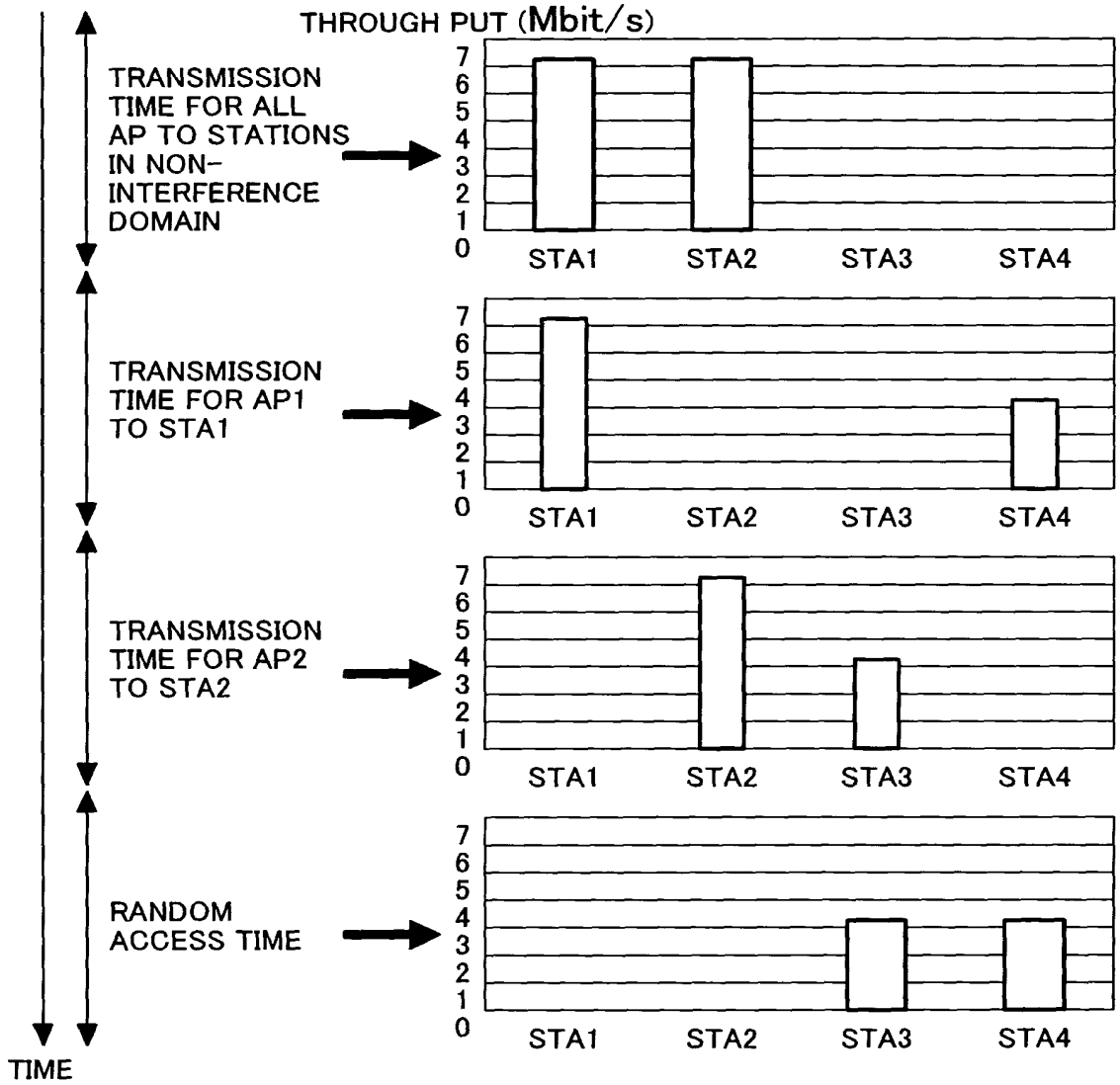
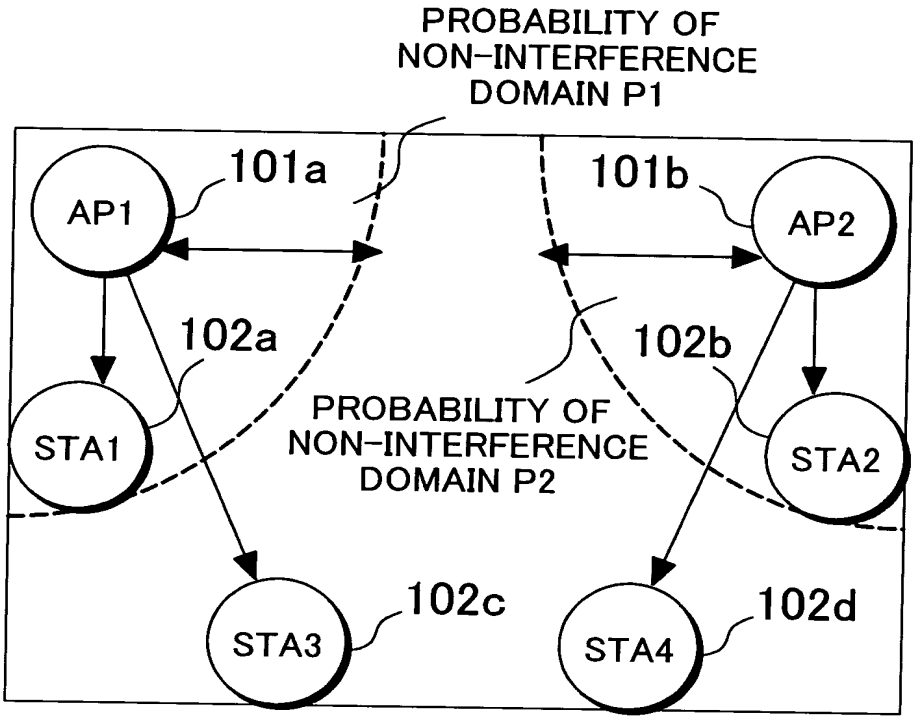
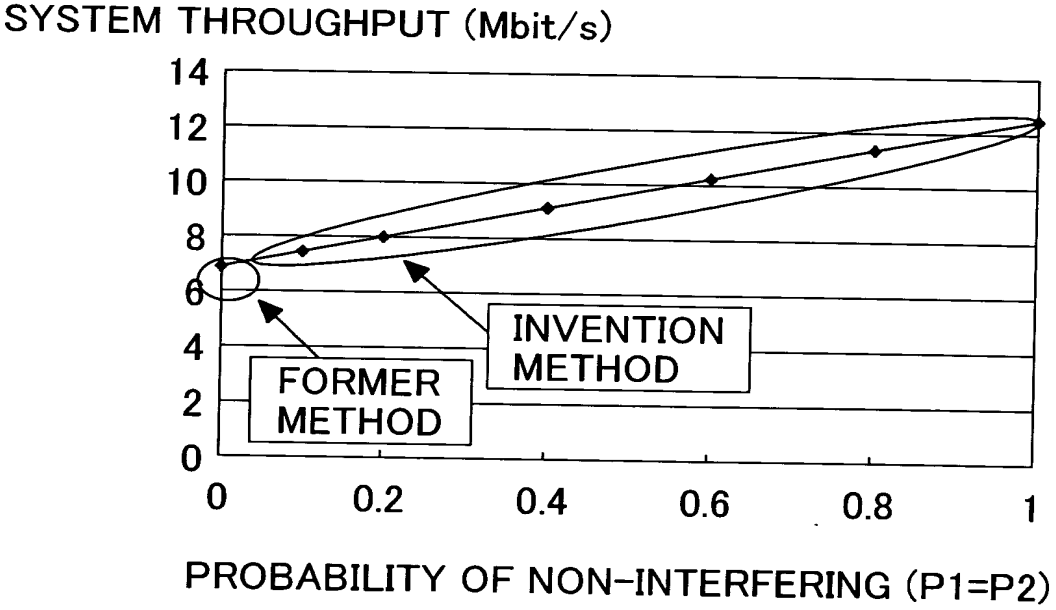

THROUGH PUT (Mbit/s)
TRANSMISSION TIME FOR ALL AP TO STATIONS IN NON-INTERFERENCE DOMAIN
TRANSMISSION TIME FOR AP1 TO STA1
TRANSMISSION TIME FOR AP2 TO STA2
RANDOM ACCESS TIME
TIME
0
1
2
3
4
5
6
7
STA1
STA2
STA3
STA4

FIG.14



THE EFFECT AT THE TIME OF 2 PARALLEL TRANSMISSIONS